

WHAT IS CLAIMED IS:

1. A semiconductor device, comprising:

a first semiconductor chip including a bipolar transistor which constitutes a power supply control circuit that converts a first voltage to a second voltage;

a second semiconductor chip including an amplifier circuit using the second voltage as a power supply; and

a wiring board equipped with the first and second semiconductor chips,

wherein the wiring board includes a first surface over which the first and second semiconductor chips are mounted, and a second surface provided at the side opposite to the first surface,

wherein a first electrode for an emitter electrode of the bipolar transistor and a second electrode for a collector electrode of the bipolar transistor are provided over the first surface,

wherein a third electrode for the first voltage and a fourth electrode for the second voltage are provided over the second surface, and

wherein connecting portions extending in the direction intersecting the first and second surfaces of the wiring board are provided in a wiring path in the wiring board, which electrically connects the first electrode of the first surface and the third electrode of

the second surface to each other, and a plurality of the connecting portions are bonded to the first electrode and the third electrode.

2. A semiconductor device according to claim 1, wherein connecting portions extending in the direction intersecting the first and second surfaces of the wiring board are provided in a wiring path in the wiring board, which electrically connects the second electrode of the first surface and the fourth electrode of the second surface to each other, and a plurality of the connecting portions are bonded to the second electrode and the fourth electrode.

3. A semiconductor device according to claim 1, wherein the emitter electrode provided in the first semiconductor chip and the first electrode of the wiring board are electrically connected to each other by bonding wires.

4. A semiconductor device according to claim 3, wherein each of the bonding wires is bonded to an area of the first electrode, to which the connecting portions are not bonded.

5. A semiconductor device according to claim 1, wherein the wiring board is built in a cellular phone.

6. A semiconductor device according to claim 1, wherein the amplifier circuit is adaptable to amplification of signals lying in a plurality of frequency bands.

7. A semiconductor device according to claim 6, wherein the plurality of frequency bands are a 900MHz band, a 1800MHz band and a 1900MHz band.

8. A semiconductor device according to claim 1, wherein a plurality of the connecting portions bonded to the first electrode and the third electrode are respectively provided in a state in which they extend linearly so as to reach from the first electrode to the third electrode.

9. A semiconductor device according to claim 1, wherein a wiring extending in the direction along the first and second surfaces of the wiring board is provided in the wiring path which electrically connects the first electrode of the first surface and the third electrode of the second surface to each other, and a wiring path length of each of the first electrode and the wiring is shorter than the length equivalent to the lengths of three of a plurality of electrodes including the third and fourth electrodes disposed over the second surface of

the wiring board.

10. A semiconductor device according to claim 1, wherein the third electrode of the second surface of the wiring board is provided directly below the emitter electrode of the first semiconductor chip over the first surface.

11. A semiconductor device according to claim 1, wherein the connecting portions are formed by providing a conductor film into viaholes defined in the wiring board.

12. A semiconductor device, comprising:

a first semiconductor chip including a bipolar transistor of a power supply control circuit that converts a first voltage to a second voltage;

a second semiconductor chip including an amplifier circuit using the second voltage as a power supply; and

a wiring board equipped with the first and second semiconductor chips,

wherein the wiring board includes a first surface over which the first and second semiconductor chips are mounted, and a second surface provided at the side opposite to the first surface,

wherein a first electrode for an emitter electrode of the bipolar transistor and a second electrode for a collector electrode of the bipolar transistor are

provided over the first surface,

wherein a third electrode for the first voltage, which is electrically connected to the first electrode through the wiring path of the wiring board, and a fourth electrode for the second voltage, which is electrically connected to the second electrode through the wiring path in the wiring board are provided over the second surface, and

wherein the third electrode and the fourth electrodes are disposed adjacent to each other.

13. A semiconductor device according to claim 12, wherein connecting portions extending in the direction intersecting the first and second surfaces of the wiring board are provided in a wiring path which electrically connects the first electrode of the first surface and the third electrode of the second surface to each other, and a plurality of the connecting portions are bonded to the first electrode and the third electrode.

14. A semiconductor device according to claim 12, wherein the emitter electrode provided in the first semiconductor chip and the first electrode of the wiring board are electrically connected to each other by bonding wires.

15. A semiconductor device according to claim 14,

wherein connecting portions extending in the direction intersecting the first and second surfaces of the wiring board are provided in a wiring path which electrically connects the first electrode of the first surface and the third electrode of the second surface to each other, a plurality of the connecting portions are bonded to the first electrode and the third electrode, and each of the bonding wires is bonded to an area of the first electrode, to which the connecting portions are not bonded.

16. A semiconductor device according to claim 12, wherein connecting portions extending in the direction intersecting the first and second surfaces of the wiring board are provided in a wiring path which electrically connects the second electrode of the first surface and the fourth electrode of the second surface to each other, and a plurality of the connecting portions are bonded to the second electrode and the fourth electrode.

17. A semiconductor device according to claim 12, wherein the third electrode of the second surface of the wiring board is provided directly below the emitter electrode of the first semiconductor chip over the first surface.

18. A semiconductor device, comprising:  
a first semiconductor chip including a field effect

transistor of a power supply control circuit which converts a first voltage to a second voltage;

a second semiconductor chip including an amplifier circuit using the second voltage as a power supply; and

a wiring board equipped with the first and second semiconductor chips,

wherein the wiring board includes a first surface over which the first and second semiconductor chips are mounted, and a second surface provided at the side opposite to the first surface,

wherein a first electrode for a source electrode of the field effect transistor and a second electrode for a drain electrode of the field effect transistor are provided over the first surface,

wherein a third electrode for the first voltage and a fourth electrode for the second voltage are provided over the second surface, and

wherein connecting portions extending in the direction intersecting the first and second surfaces of the wiring board are provided in a wiring path which electrically connects the first electrode of the first surface and the third electrode of the second surface to each other, and a plurality of the connecting portions are bonded to the first electrode and the third electrode.

19. A semiconductor device according to claim 18, wherein connecting portions extending in the direction

intersecting the first and second surfaces of the wiring board are provided in a wiring path which electrically connects the second electrode of the first surface and the fourth electrode of the second surface to each other, and a plurality of the connecting portions are bonded to the second electrode and the fourth electrode.

20. A semiconductor device according to claim 18, wherein the source electrode provided in the first semiconductor chip and the first electrode of the wiring board are electrically connected to each other by bonding wires, and each of the bonding wires is bonded to an area of the first electrode, to which the connecting portions are not bonded.